PATENT SPECIFICATION

(11) 1 458 836

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(21) Application No. 56037/73 (22) Filed 4 Dec. 1973
(31) Convention Application No. 311 720
(32) Filed 7 Dec. 1972 in
(33) United States of America (US)
(44) Complete Specification published 15 Dec. 1976
(51) INT CL² D06M 13/30, 13/32
(52) Index at acceptance
D1P 21Y 23Y 240 272 27Y 360 364 36Y 370 52Y 53Y 541 54Y 581 588 610 634 636 641 65Y 662 66Y A18 B2B1 B5B C2A10 C2A12A9 C2C10 C2C17 C2C3 C2C7 C2C9 L6

(19)

(54) FABRIC CONDITIONING

(71) We, COLGATE-PALMOLIVE COMPANY, a Corporation organised under the laws of the State of Delaware, United States of America, of 300 Park Avenue, New York, New York 10022, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method for treating textile fabrics to impart softening, smoothness, and soil-release characteristics thereto.

The washing agents commonly used in laundering consist of soap and/or synthetic detergents, such as long-chain alkyl sulphates or sulphonates and fatty alcohol condensation products, which are usually mixed with builder salts, such as alkali metal carbonates, silicates and/or phosphates. These builder salts have a tendency to react with the calcium and magnesium ions present in the ordinary washing water, whereby mineral salts are precipitated which are liable to be deposited onto the fibres of the textile fabrics during the washing operation, especially if detergent compositions are used that are not capable of keeping the soil and other undissolved substances sufficiently suspended in the washing solution. The mineral salts deposited onto the fibres render the fabrics liable to be weakened, particularly at those parts which are exposed to friction or rubbing, for instance the edges of collars and cuffs. In addition, the deposited mineral salts give the laundered textiles a poor, boardy feel, particularly at those areas of the fabric which are exposed to friction and creasing, such as collars and cuffs. This poor hand of laundered fabrics and resulting discomfort in wear have in part created a demand for softer compositions capable of improving the softness of "hand" of laundered textile fabrics. It has been found that the treatment of such materials with softening agents improves their softness of feel and may prolong their useful life. Softeners also facilitate ironing by lubricating the fibres so that wrinkling is reduced and friction between fibres and the iron is reduced. Additionally, it has been found that treatment of fabrics with softeners generally results in a fabric having a reduced tendency to accumulate electrical charges which create undesirable static cling.

Many synthetic textile fibres when used alone or incorporated into blends with natural fibres have a propensity to accept and retain soil such as oily grime. Accordingly, when a garment of a fabric made from such fibre or fibre blend is being worn the soil accumulates on the garment and is difficult to remove properly except by a dry cleaning process. The cleaning process normally employed, however, is washing in a conventional home washing machine. During the washing operation it is virtually impossible to remove all of the soil from the garment, while some of the soil that is removed from the garment into the wash water is redeposited onto the garment. Hence, the garment is not properly cleaned.

The problem with washing fabrics having synthetic fibres incorporated therein, or made entirely of synthetic fibres, is that the synthetic fibres, as well as being hydrophobic, are oleophilic. Therefore, while the oleophilic characteristics of the fibre permit oily soil to be readily embedded therein, the hydrophobic properties of the fibre prevent water from entering the fibre to remove contaminants therefrom. Attempts have been made to reduce oleophilic characteristics of synthetic fibres by coating the fibres with a coating that is oleophobic, i.e. will hinder the attachment of oily soil to the fibres.

Many polymer systems have been proposed which are capable of forming a film around the fibres, particularly acid emulsion polymers prepared from organic acids having reactive points of unsaturation. These treating polymers are known as soil-release agents.

The term "soil-release" as used herein refers to the ability of the fabric to be washed

or otherwise treated to remove soil, including oily soil, that has come into contact with the fabric.

Concentrated solutions of soil-release agents have been padded onto fabrics by textile manufacturers to impart a permanent soil-release finish to the fabric. As the amount of soil-release agent on the fabric is increased, the capability of the fabric to release soil is increased. However, fabrics with this permanent soil-release finish have disadvantages. As the amount of soil-release agent on the fabric is increased, the fabric has a tendency to become stiffer and lose the desirable hand characteristic of the fabric. Fabrics with a heavy application of soil-release agent do not have the same desirable appearance and hand as the same fabrics without the soil-release coating. Furthermore, in practice there is a set range of soil release agents that can be applied, dictated by commercial success.

It has now been discovered that dilute solutions of anionic surfactants give unexpectedly good softening and a smooth, non-scratching, soft feeling to natural and synthetic fabrics when sprayed directly onto the fabrics. After the treated fabrics are ironed or otherwise dried they have good soil-release characteristics.

According to the present invention a method for conditioning a fabric having synthetic fibres incorporated therein comprises spraying the fabric with an aqueous solution of from 0.5% to 10% by weight of an anionic surfactant selected from alkyl benzene sulphonates wherein the alkyl group has from 10 to 20 carbon atoms, alkyl toluene sulphonates wherein the alkyl group has from 10 to 20 carbon atoms, sulphated or sulphonated aliphatic alcohols having from 10 to 20 carbon atoms, ethoxylated alcohol sulphates produced from an aliphatic alcohol having from 10 to 20 carbon atoms ethoxylated with from 1 to 6 moles of ethylene oxide, soaps of fatty acids having from 10 to 20 carbon atoms, olefin sulphonates having from 10 to 20 carbon atoms, paraffin sulphonates having from 10 to 20 carbon atoms, N - (2-hydroxy - alkyl) - amino acids having from 10 to 20 carbon atoms in the alkyl chain, and mixtures thereof, the composition being sprayed from a pressurized container containing the composition and a propellant and having a discharge valve actuatable to dispense the composition from the container in the form of a spray.

The method of the present invention does not wholly prevent the attachment of soil to the fabric, but hinders such attachment and renders the fabric susceptible to successful cleaning by a washing operation. While the reason for this result is still uncertain, it may be that soiled, previously sprayed fabric when immersed in detergent-containing wash water experiences an agglomeration of oil at the surface. These globules of oil are then removed from the fabric and rise to the surface of the wash water. This phenomenon takes place in the home washing machine during continued agitation, but the same effect has been observed even under static conditions. For example, a strip of polyester/cotton fabric sprayed in accordance with the method of the present invention and soiled with crude oil, when simply immersed in a detergent solution will lose the oil even without agitation.

The alkyl benzene sulphonates and alkyl toluene sulphonates may be prepared by sulphonating the corresponding alkylaromatic hydrocarbons. Some sulphonation processes utilize 100% sulphuric acid or weak oleum although anhydrous sulphur trioxide can also be used. Excess unsaponifiable material is removed from the sulphonation mixture prior to neutralization to obtain alkylarylsulphonates of low salt content. The resulting alkylarylsulphonates may be deodorized by treatment with superheated steam or hot nitrogen gas. The colour can be substantially removed from the alkylarylsulphonates by treating an aqueous solution of the sulphonate with hydrogen and a hydrogenation catalyst at elevated temperatures.

The sulphated and sulphonated alcohols may be prepared by sulphation or sulphonation of alcohols such as are produced from coconut oil, tallow or palm seed oil by esterification of the fatty acids with lower aliphatic alcohols and reduction of the mixture of esters with sodium. Sulphonation is carried out at elevated temperatures with fuming sulphuric acid, sulphur trioxide or chlorsulphonic acid.

The ethoxylated alcohol sulphates may be derived from linear aliphatic alcohols having a carbon chain of from 10 to 20 atoms which has been reacted with from 1 to 6 moles of ethylene oxide. The longer the alkyl group, the more moles of ethylene oxide can be reacted with a mole of the alcohol. The ethoxylated alcohol sulphates are commonly prepared by reaction of the appropriate alcohol with sufficient ethylene oxide followed by sulphation of the reaction product in known manner, such as by the use of oleum or chlorsulphonic acid. The purity of the reaction product is a consideration for the manufacture of a composition having optimum properties. Depending upon the method of manufacture, there are usually present varying amounts of organic impurities in admixture with the sulphated ethoxylated alcohols. The organic impurities may include unreacted nonionic (unsulphated) ethoxylated alkyl materials and small amounts of degradation products such as partially deethoxylated products. These organic impurities should be kept to a minimum since an excessive amount has been found to affect adversely the physical properties and perform-

ance of the product. More particularly an excessive amount, particularly of the unreacted nonionic ethoxylated alkyl material, has a tendency to raise the cloud point, inhibit foam and decrease the efficiency of the product as an emulsifier of greasy soil in washing operations. The product may contain a minor amount of such organic unreacted or by-product materials provided that the amount is insufficient substantially to affect the properties of the product adversely. In general, the ethoxylated alcohol sulphate material should have a purity of at least 75% by weight of the total organic solids in the material, with up to 25% of other organic solids. For optimum effects, it is preferred that the organic solids of the ethoxylated alcohol sulphate material should contain not substantially in excess of 10% unsulphated ethoxylated alcohol, by weight of the organic solids in the ethoxylated alcohol sulphate material. A typical product may contain about 10% of impurities on an organic solids basis. The impurities are kept to these low levels by any suitable technique. The careful control of conditions in the sulphation procedure, including the time of reaction and the choice of sulphating agent will produce materials of desired purity. If desired, the reaction product may be purified to remove the organic impurities, such as by the use of an ion-exchange technique.

The soaps are soaps of carboxylic acids having a carbon chain length of from 10 to 20 carbon atoms. Water-soluble soaps, such as sodium and potassium and other suitable alkali metal soaps, or soaps of nitrogenous bases such as ammonia or triethanolamine, derived from fats and oils such as tallow, coconut oil, cottonseed oil, soybean oil, corn oil, olive oil, palm oil, peanut oil, palm kernel oil, lard, greases and fish oils, as well as their hydrogenated derivatives and mixtures thereof, may be used.

The olefin sulphonates can be made from Fischer-Tropsch hydrocarbons, made by the hydrogenation of carbon monoxide and which contain a relatively high proportion of straight-chain olefins. The olefin sulphonates may also be derived from alpha olefins or olefins in which the double bond is randomly distributed along the chain. The sulphonation is carried out at low temperatures to avoid polymerization and side reactions. Certain fractions of shale oil are rich in olefins, and these can be sulphonated to form anionic surfactants. The starting materials and the final product, however, require considerable purification if surfactants of good colour and softening characteristics are to be obtained.

To prepare the paraffin sulphonates, the paraffins may be oxidized to fatty acids by air-blowing at temperatures below 150° C. in the presence of small amounts of potassium permanganate. An alternative oxidation process involves oxidation with nitrogen dioxide dissolved in sulphuric acid. The resulting acids are then sulphonated by conventional means, such as by the use of oleum or chlorsulphonic acid.

To prepare the N - (2 - hydroxyalkyl)-amino acids, epoxidized alpha olefins may be reached with amino acids such as sarcosine (N-methyl glycine) and imino diacetic acid. A typical acid for use in the solutions employed in the method of the present invention is N-(2-hydroxyalkyl) sarcosine.

The anionic surfactants are dissolved in water to make the said dilute solution which is sprayed directly onto wet or dry fabrics. The anionic surfactant is present in the solution in a proportion in the range from 0.5% to 10% by weight, preferably from 1% to 5% by weight. In addition to the anionic surfactant, the solution may contain perfumes, germicides and agents to resist attack of fungus and mildew.

The solution may also include a silicone polymer lubricant, which serves as an ironing aid. This makes it easier to push the iron over previously sprayed fabric during subsequent ironing. The proportion of silicone polymer lubricant needed in the solution is small, usually in the range from 0.15% to 1.5. Suitable silicone polymer lubricants include the dimethylpolysiloxane fluids. To aid in dispersing the silicone polymer in the aqueous medium, an organic solvent may be present in a proportion in the range from 5% to 20% by weight; the preferred organic solvents are ethanol, propanol, isopropanol and ethylene glycol.

Fabric conditioning compositions containing the said anionic surfactants and silicone polymer lubricants are the subject of our British Patent Application No. 22613/76 (Serial No. 1,458,837) which has been divided herefrom.

The pressurized containers may be of the "aerosol" type, such as are common for various household purposes, and which dispense the solution in the form of a spray. The general technology of such pressurized containers is applicable to the method of the invention and need not be set forth in detail. Gases and liquified gases such as nitrogen, isobutane, halogenated hydrocarbons and carbon dioxide are useful as the propellant.

The solution is preferably applied to the fabrics by placing the fabrics horizontally on a surface such as an ironing board. The container is held approximately 18—24 inches away, and the spray is applied lightly and evenly over the entire surface. Particular areas of the fabric may be treated with heavier sprays where greater softening and/or soil-release properties are required.

The following examples illustrate the invention. All percentages are by weight:

Example I.
Soil-Release Tests.

Fabric-treating aqueous solutions were formulated from the following anionic surfactants, at 1% concentration:

A. Tallow alcohol sulphate
B. Linear tridecyl benzene sulphonate
C. Sodium lauryl sulphate

These anionics were compared against a well-known cationic fabric softener:

D. Di-hydrogenated tallow dimethyl ammonium chloride.

The fabric treating compositions were sprayed onto 80 × 80 cotton and 80 × 80 polyester/cotton (65% polyester, 35% cotton) with permanent press finish swatches (No. 7406, Testfabrics, Inc., U.S.A.). The swatches were ironed dry, stained with mustard or blackberry juice, and aged overnight.

The swatches were then each washed with 5 ml of a 0.5% solution of synthetic detergent (18% anionic, 7% silicate, 33% sodium tripolyphosphate) in 500 ml of water of 90 ppm hardness at 120° F. for ten minutes. The swatches are air-dried and compared visually according to the following scale:

−2 much worse than no treatment
−1 somewhat worse than no treatment
0 same as no treatment
+1 somewhat better than no treatment
+2 much better than no treatment

The results of the comparison are tabulated below:

Treatment	Cotton		Polyester Cotton	
	Mustard	Blackberry	Mustard	Blackberry
A	-2	-1	-1	2
B	-2	-1	+1	-1
C	-1	0	0	-1
D	-2	-2	-2	-2

The above results show that the anionic surfactant fabric treatment methods of this invention give much better soil-release than a well known cationic softener.

Example II.
Softening Tests.

The following aqueous liquids were sprayed onto fabrics:

A. Control-water only.
B. Di-hydrogenated tallow dimethyl ammonium chloride, 2% aqueous solution.
C. Linear tridecyl benzene sulphonate, 1% aqueous solution.
D. Linear tridecyl benzene sulphonate, 3% aqueous solution.

Cotton swatches (80 × 80) were sprayed with the liquids described above and ironed to dryness with a hand electric iron. The swatches were then rated by a panel of seven people for softness. The following Table shows the number of preference votes for each treating liquid:

	A vs. B	A vs. D	B vs. D	B vs. C
A	0	0		
B	7		2	2
C				5
D		7	5	

The following Table shows preferences of anionics tested for softness when rated by a panel of seven, the anionics being used at 1% concentration in water.

Softener	1st Choice	2nd Choice	3rd Choice
Linear tridecyl benzene sulphonate	5	1	0
Sodium lauryl sulphate	0	1	1
Tallow alcohol sulphate	1	1	2
Linear dodecyl benzene sulphonate	0	4	0
Linear dodecyl benzene sulphonate amine oxide	1	0	4
Control (water)	0	0	0

Example III.

Ironing Aid Composition.

An ironing aid composition incorporating an anionic surfactant and imparting good softness and soil-release to fabrics sprayed therewith was formulated as follows:

	Percent by Weight
Silicone polymer*	0.5
Ethanol	10.0
Linear tridecyl benzene sulphonate	1.0
Deionized water	88.5

*35% AI oil-in-water emulsion of dimethylpolysiloxane of viscosity 60,000 ±5 centistokes.

A stiffening agent may be included to aid in keeping wrinkles from reforming immediately after ironing. A 0.5% by weight concentration of starch or other film forming agent was found to be adequate.

Ironing aid compositions are formulated as follows:

A. 5% solution of the following:

	% by weight
Di-hydrogenated tallow dimethyl ammonium chloride	2.92
Linear tridecyl benzene sulphonate	16.90
Ethanol	50.00
Deionized water	30.18

B. 5% solution of linear tridecyl benzene sulphonate

C. 5% solution of the following:

10% solution of linear tridecyl benzene sulphonate	50 g.
Stearyl dimethyl amine oxide	20 g.

D. 5% solution of N - (2-hydroxy octadecyl)-sarcosine sodium salt

E. 5% solution of N - (2-hydroxy hexadecyl)-sarcosine, sodium salt

F. 5% solution of N - (2-hydroxy dodecyl) - sarcosine, sodium salt

G. 5% solution of sodium lauryl sulphate.

The properties of the above composition are tabulated below:

Composition	Appearance	Ironing ease without silicone
A	two-phase solution	iron drags a little
B	one-phase solution	average (no drag)
C	opaque white (viscous)	iron drags
D	white (viscous)	easy ironing
E	hazy solution	easy ironing
F	hazy solution	easy ironing
G	one-phase solution	easy ironing

Ironing aid compositions incorporating a small amount of starch were formulated:

	% by weight	
Silicone polymer (dimethyl polysiloxane)	0.5	0.2
Ethanol	10.0	5.0
General Electric 'Antifoam 20'	0.5	0.2
Perfume	0.03	0.05
Linear tridecyl benzene sulphonate	1.0	1.0
Starch	0.5	1.0
Deionizing water	87.47	92.55

Example IV.
Ironing aid compositions can be formulated from mixtures of anionic surfactants, including soap, as follows:

	% by weight	
Dimethylpolysiloxane polymer	0.5	0.5
Ethanol	10.0	10.0
Linear tridecyl benzene sulphonate	1.0	1.0
Soap (sodium soap of mixed coconut and tallow acids)	2.0	1.0
Deionized water	86.0	87.0
Perfume	0.5	0.5

The fabric treating compositions exemplified give excellent fabric softening and soil-release characteristics to fabrics sprayed therewith. The solutions employed in the method of the present invention are generally lower in cost than the conventional cationic softeners. Since cationics are substantive to cotton and tend to hold onto soils, the anionics, which are not substantive, give superior soil-release. Since in the method of the present invention the solutions are sprayed on, and then the fabrics ironed dry or allowed to air dry, a portion of the article to be treated may be selected, rather than treating the entire article as in the washing machine softening methods. The method of the present invention allows a controlled amount of treatment for individual fabrics, depending on the desired effect on the fabric.

WHAT WE CLAIM IS:—

1. A method for conditioning a fabric having synthetic fibres incorporated therein, comprising spraying the fabric with a composition comprising an aqueous solution of from 0.5% to 10% by weight of an anionic surfactant selected from alkyl benzene sulphonates wherein the alkyl group has from 10 to 20 carbon atoms, alkyl toluene sulphonates wherein the alkyl group has from 10 to 20 carbon atoms, sulphated or sulphonated aliphatic alcohols having from 10 to 20 carbon atoms, ethoxylated alcohol sulphates produced from an aliphatic alcohol having from 10 to 20 carbon atoms ethoxylated with from 1 to 6 moles of ethylene oxide, soaps of fatty acids having from 10 to 20 carbon atoms, olefin sulphonates having from 10 to 20 carbon atoms, paraffin sulphonates having from 10 to 20 carbon atoms, N - (2 - hydroxyalkyl) - amino acids having from 10 to 20 carbon atoms in the alkyl chain, and mixtures thereof, the composition being sprayed from a pressurized container containing the composition and a propellant and having a discharge valve actuatable to dispense the composition from the container in the form of a spray.

2. A method as claimed in Claim 1 wherein the anionic surfactant in the composition employed is linear tridecyl benzene sulphonate.

3. A method as claimed in Claim 1 or Claim 2 wherein the composition employed also contains a silicone polymer lubricant.

4. A method as claimed in Claim 3 wherein the silicone polymer lubricant in the com-

position employed is a dimethylpolysiloxane.

5. A method as claimed in Claim 3 or Claim 4 wherein the composition employed contains the silicone polymer lubricant in a proportion in the range from 0.15% to 1.5% by weight.

6. A method as claimed in any of Claims 3 to 5 wherein the composition employed also includes an organic solvent.

7. A method as claimed in any of the preceding claims which includes ironing the fabric after spraying it with the composition.

8. A method as claimed in Claim 1 and substantially as described in any of the Examples.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1976.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.